

REBOUND is an N-body integrator, i.e. a software package that can integrate the motion of planetary systems over large time scales is reliable and reasonably fast (Rein and Tamayo 2015). Our work has been to compress detailed descriptions of the coordinates (position and velocity) of each planetary body to aid in more quickly determining celestial events (such as transits) without the need for a second integration.





Divergence of nearby orbits in the solar system (Laskar 1989).

# **COORDINATE INTERPOLATION AND DATA COMPRESSION USING REBOUND**

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### Summary

space than simply storing the data and calculates results by interpolation 10 to 100 times more quickly than integrating from a saved REBOUND simulation archive snapshot.

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Using the infinitely differentiable Kepler coordinates (Pál 2009) or pal coordinates, which use Jacobi coordinates rather than heliocentric coordinates, we can more easily capture the subtle variations in orbital elements. After removing any obvious polynomial trends, we can perform an FMFT and compute how the frequencies vary in time. This gives a more accurate closed form to the quasi-periodic motion.



## Method



The residuals (dark blue) after our compression algorithm for Earth (original coordinates in light blue) over 50 years.

### References

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